Responsible fishing in Canada
1999/2000

A D I A N F I S H E R I E S

RESPONSIBLE FISHERIES

SUMMARY

RESPONSIBLE FISHING IN CANADA
A REVIEW (1999 – 2002)

DECEMBER 2001

INTRODUCTION

In response to the need for long-term development of conservation-oriented and economically viable Canadian fisheries, practising fish harvesters in partnership with government have embarked on a program of responsible fishing. The primary goal of the program is the development of sustainable and economically viable fisheries for present and future generations of Canadians.

Responsible fishing is a fundamental component of sustainable fisheries and refers to fishing that is:

"Conducted in an environmentally responsible manner using conservation harvesting practices with selective fishing gear for the protection of stocks and the aquatic environment, ensuring catches in the short-term never exceed the long-term sustainable yield and the development of economically viable fisheries."

Development of responsible fishing in Canada is being achieved through several separate but integrated initiatives:

1. The development and implementation of the Canadian Code of Conduct for Responsible Fishing Operations;

2. Development and implementation of conservation harvesting technologies and practices;

3. Development and implementation of industrial training programs in responsible fishing; and

4. The exchange of technical information among practising skippers and other industry stakeholders at the national and international level.

THE CANADIAN CODE OF CONDUCT FOR RESPONSIBLE FISHING OPERATIONS

The need for a Canadian Code of Conduct for Responsible Fishing Operations was first recognized in 1995 following the collapse of many of Canada's traditional fisheries. Responding to the need for conservation measures that would help rebuild, maintain, and strengthen Canadian fisheries, a number of fisher's organizations from across Canada initiated Code development as a means of achieving sustainable, conservation-based, and economically viable commercial fisheries.

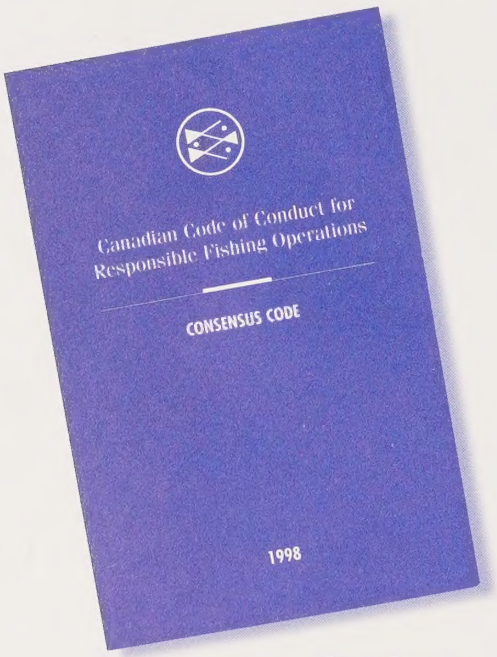
The Canadian Code builds on the international Code of Conduct for Responsible Fishing developed by the United Nations Food and Agriculture Organization (FAO) and adopted in 1995 by 80 countries, including Canada. The Canadian Code, built for industry by the industry, is compatible

Fisheries and Oceans Canada Pêches et Océans Canada

Canada

and complementary with the FAO Code, but meets the unique needs of Canadian fisheries.

In the early stages of Code development, an Industry Steering Group was formed to oversee code development and a Secretariat established in DFO to provide support. The Code was developed with extensive consultations with grassroots fishers from all sectors and regions of Canada, culminating with the National Fishing Industry



Workshop in Toronto. Over sixty industry participants, including representatives from the Fisheries Council of Canada and the Canadian Council of Professional Fish Harvesters, attended the workshop, making it the first time ever that all sectors of Canada's fishing industry were represented at a national forum.

Participants agreed to:

- the Code text;
- a process for ratification; and
- a governance structure.

The endorsement of the Canadian Code of Conduct for Responsible Fishing Operations Consensus Code by participants attending the January 9 and 10, 1998 National Fishing Industry Workshop ushered in a new era in Canadian fisheries and marked a unique page in the long history of Canada's fishing industry.

At the core of the Canadian Code of Conduct for Responsible Fishing Operations are nine (9) general principles, the foundation on which sustainable, conservation-based fisheries can be built. These principles are the basis on which thirty-eight (38) operational guidelines for achieving conservation have been formulated. These guidelines assist fishers in ensuring that their harvesting operations are conducted in a responsible manner and cover specific areas of harvesting including:

- fishing gears,
- vessels,
- cooperation and partnership,
- protection of the resource and environment,
- access and enforcement, and
- education, research, and public awareness.

The Code governs all commercial fishing operations taking place in Canadian waters and has as its primary objective to:

> *"Achieve sustainability in marine and freshwater fisheries for present and future generations of Canadians by directly contributing to the conservation of stocks and the protection of the aquatic environment."*

Given the diversity of sectors, the array of gear types used in Canada, and the many species fished, guidelines are not specific, but provide the basis for needed action. To illustrate:

APPLYING THE CODE IN PRACTICE

An example:
Principle #2:
"... fish harvesters will take appropriate measures to pursue the ecological sustainability of Canadian fisheries."

Operational Guideline 2.1
(to help achieve the Principle):

"Develop protocols (including, when practical and appropriate, the use of selective fishing gears and practices) regarding the catch of non-targeted resources that jeopardize the health of the stocks".

The Canadian Responsible Fisheries Board, comprised of harvester representatives, was established with a three-year mandate to promote ratification of the Code. By year three of the Board's Mandate, more than 70 organizations representing all fleet and gear sectors had ratified the Code and were putting it to action through harvesting plans specific to their respective fisheries.

In January 2002 all organizations who have ratified the Code will meet in Toronto to put in place a new governance board. This new board will be charged with implementation of the Code.

Benefits of the Code of Conduct
The potential use and benefits of this ground-breaking initiative are far-reaching and the Code itself has become the impetus for further cooperative relationships between other fishery related organizations and government institutions at the local, regional, and national level.

Specifically, the Code:

1. Provides workable guidelines for attaining sustainable fish harvesting;

2. Demonstrates that the Canadian fishing industry is committed to the effective conservation of aquatic resources;

3. Provides a framework for industry to assume an increased role in fisheries management.

4. Lays the foundation for the professionalization of fishers; and

5. Provides educators in the field with the basis for curriculum and program development by identifying areas where educational expertise is needed and applicable.

Gabrielle Landry and Marc Allard of the industry's Canadian Responsible Fisheries Board promote conservation harvesting and the Code of Conduct at the October 1999 Quebec fishing industry and aquaculture conference.

National Awards Promote Code
Charged with promoting the public image of commercial fishing in Canada, the Canadian Responsible Fisheries Board created the National Awards Program for Responsible Fishing and the Roméo LeBlanc Medal. These national awards publicly recognize Canadian fishers who have made an outstanding contribution to the practice of responsible fishing principles as expressed in the Canadian Code. The Right Honourable Roméo LeBlanc, former Governor General of Canada and a former Minister of Fisheries and Oceans Canada, has lent his name and patronage to the awards.

The awards program calls for a practising commercial fisher from each of the Atlantic, Pacific, Arctic, and freshwater fisheries to be selected each year to receive the national award and from these, a finalist is chosen to receive the Roméo LeBlanc Medal.

National Award Winners for 2000 are from left to right: George Feltham, Atlantic; Davidee Evic, Arctic; Robert T. Krisjansen, freshwater; and Les Rombough, Pacific.

In April 2000, the first National Awards ceremony was held in Ottawa in Rideau Hall. Laureates were: Les Rombough, Pacific; Davidee Evic, Arctic; Robert T. Krisjansen, freshwater; and George Feltham, Atlantic. Mr. George Feltham of Newfoundland was the winner of the Roméo LeBlanc Medal. Finalists for the year 2001 were: George Purvis, freshwater; Stevie Audlakiak, Arctic; Stan Logan, Pacific; and Pierrot Haché, Atlantic. The Roméo LeBlanc was awarded to Pierrot Haché.

The Honourable Herb Dhaliwal, Minister of Fisheries and Oceans, in his address at the 2001 awards ceremony, stated that the true spirit of the awards had been expressed by Romeo LeBlanc:

The Roméo LeBlanc medal

"You have given your efforts not for your own benefit, but for other Canadians and the resource itself. You did it on your own time and your own initiative, without a thought of reward, so you have given us not only a richer resource, but a model of public spirit."
Romeo LeBlanc

Canada Recognized Internationally for Responsible Fishing Achievements

The International Margarita Lizarraga Medal was bestowed on the Canadian Responsible Fisheries Board and its Secretariat by the United Nations Food and Agriculture Organization (FAO) at a ceremony held in Rome, Italy on November 3, 2001. Representatives from the Canadian Responsible Fisheries Board and the Code Secretariat were on hand to accept the award.

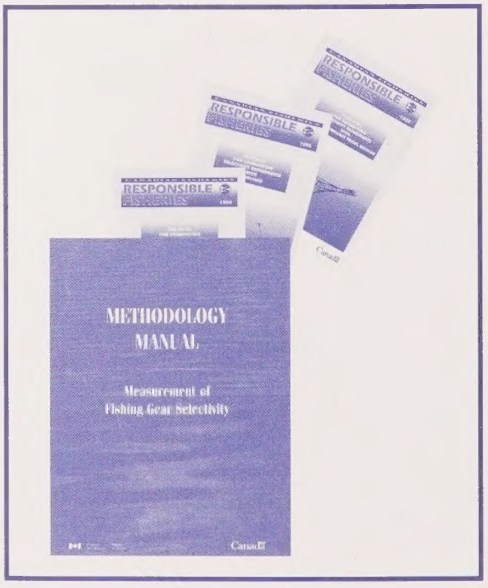
The award is in recognition of Canada's outstanding and practical application of the FAO Code of Conduct for Responsible Fisheries and for its unprecedented grassroots approach to the development of the Canadian Code of Conduct for Responsible Fishing Operations.

DEVELOPMENT OF HARVESTING TECHNOLOGIES AND PRACTICES

Each year, Canada conducts numerous conservation harvesting technology projects aboard commercial vessels through a working partnership between industry and Fisheries and Oceans Canada. Undertaken in the Atlantic, Arctic, Pacific, and Great Lake regions, the primary objective of these projects is the development of more selective and energy-efficient gears and responsible fishing practices.

Tools to Assist Commercial Testing

To facilitate industry's involvement in commercial testing, DFO commissioned John Foster of AQUAPROJECTS to prepare a "Methodology Manual: Measurement of Fishing Gear Selectivity." The Manual is designed to assist fish harvesters and fisheries technicians in the planning, execution, analysis, and reporting of selectivity work.



Manual and protocols used to ensure at-sea trials are valid and reliable

The manual has also been the basis for developing gear-specific protocols that outline the specific methodology and recording and reporting requirements needed to conduct commercial experiments.

Applied Fishing Technology Research Network Established

The Responsible Fishing Technology Network, designed to meet industry's research and development needs, was initiated in 1998 by Fisheries and Oceans Canada and the Marine Institute of Memorial University of Newfoundland. The Network facilitates collaborative responsible fishing technology research projects and the exchange of related technical information between industry, government, and research institutes.

A major goal of the Network is to ensure that the best use possible is made of facilities and expertise to achieve the highest project results relevant for direct application in industry.

Commercial Projects Undertaken to Improve Harvesting Technologies and Practices

Development and implementation of conservation harvesting technologies and practices are

Conservation Objectives

- Size selectivity
- Species selectivity
- Survival of fish escapements
- Reduction of discards and wastage
- Reduction of ghost fishing
- Energy efficiency
- Protection of marine environment
- Protection of marine mammals\birds
- Improved quality of the catch

central to the achievement of the conservation objectives of the Canadian Fishing industry.

With the view that any gear can be designed to improve conservation features, Canadian fishers have conducted research on commercial vessels with significant improvements to many of the gears used in Canadian fisheries. A few examples of the type of projects undertaken will illustrate:

Atlantic Greenland Halibut (Turbot) Experiments

The Turbot Industry Working Group established in 1998 to address the issue of small fish retention has carried out a series of projects over the last several years in an attempt to find innovative and practical solutions to the problem of small fish retention in turbot trawls off the east coast of Newfoundland and Labrador.

Work began in 1998 aboard the M.V. Northern Osprey, an offshore groundfish trawler, to determine if the percentage of small fish retained in the overall catch of turbot trawls could be reduced by reducing or eliminating meshing in the fore part (using small mesh). More work has been done in this area, and as well, studies have been completed aimed at building on the existing knowledge with regard to the selectivity of turbot trawls.

Experiments Aboard the M.V. Pennysmart

In the spring of 2000, members of the Turbot Industry Working Group suggested that the acquisition of baseline data would be of great benefit to the turbot fishery. Accordingly, the group recommended commercial testing be conducted to obtain data to generate selectivity curves for a standard turbot trawl.

Fishery Products International (FPI) offered to support tests to determine the selectivity of a 145 mm mesh codend (standard gear) and the effect of small mesh (80 mm) in the entire forward and middle section of FPI's new "Millenimum" trawl constructed with meshes 160 mm or more in the fore part and a 145 mm in the codend.

Tests were undertaken with a trawl divided in two sections by a vertical panel. Attached to one side of the panel was a standard codend having a mesh of 145 mm and attached to the other side of the panel was a small-mesh, non-selective 50 mm codend (control). The L25, L50, and L75 of the standard gear was estimated to be 44.04 ± (0.26) cm, 47.74 ± (0.36) cm, and 51.45 ± (0.48) cm respectively.

The Pennysmart also conducted several trials with the "Millennium" trawl rigged with small (80 mm) mesh in the fore part. A comparison of the results obtained and those of the population measured in experiment 1 indicate that the use of small mesh in the forepart and body of the trawl prevents meshing. With a decrease in meshing, fish are directed to the codend and are selected, thereby reducing the overall catch of small turbot.

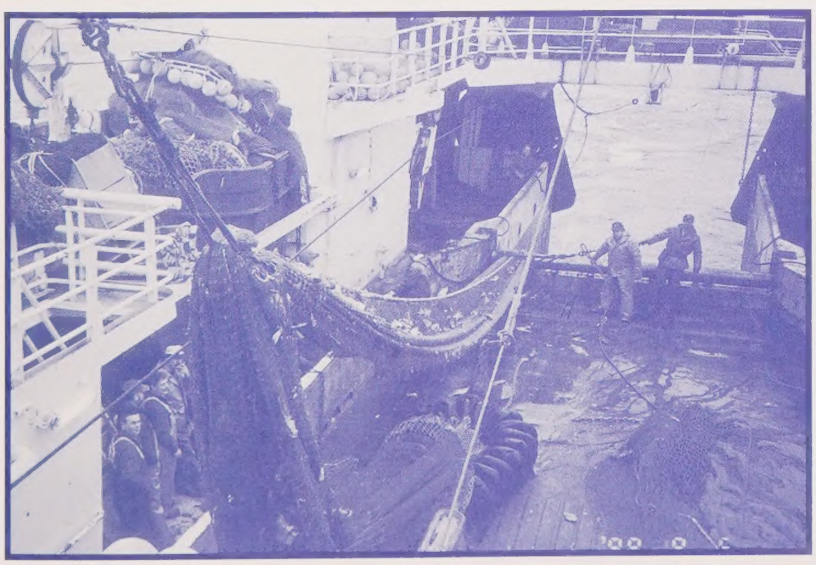
Experiment #3 - Atlantic Enterprise

During the fall 2000 fishing season Clearwater Fine Foods Incorporated continued the work begun by FPI, initiating a two-phase study.

Phase I

Phase I, at-sea comparative fishing trials were carried out in NAFO areas OB and 2G from May 21 to June 13, 2000 aboard Clearwater's M.V. Atlantic Enterprise.

The at-sea trials were designed to compare the performance of a standard turbot trawl constructed of nominal 160 mm mesh in the fore part and 145 mm in the codend and a modified standard trawl having the front part constructed of nominal 100 mm mesh and a codend of 145 mm mesh.



At-sea trials to test the impact of smaller mesh in the forepart of a turbot trawl.

A comparison of the performance of each gear in terms of the overall catch rate per hour and small fish retention rate indicates that the introduction of small mesh does not have an adverse effect on the capture of small turbot.

Phase II

From November 19, 2000 to January 01, 2001, Clearwater completed phase two of the selectivity work began in early 2000, carrying out three experiments.

Experiment one was designed to generate selectivity curves for a turbot trawl having small mesh in the fore part (100 mm) and a 145 mm codend.

Results of Experiment #1

The selectivity parameters of experimental trawl (fore part of 100 mm mesh and codend 145 mm):

L25=36.3cm
L50=46.5cm
L75=56.7cm
SR=20.4 cm

Experiment two was designed to generate selectivity curves for a standard turbot trawl 160 mm diamond mesh and 145 mm codend.

Results of Experiment #2

The selectivity parameters of experimental trawl (fore part of 160 mm mesh and codend 145 mm):

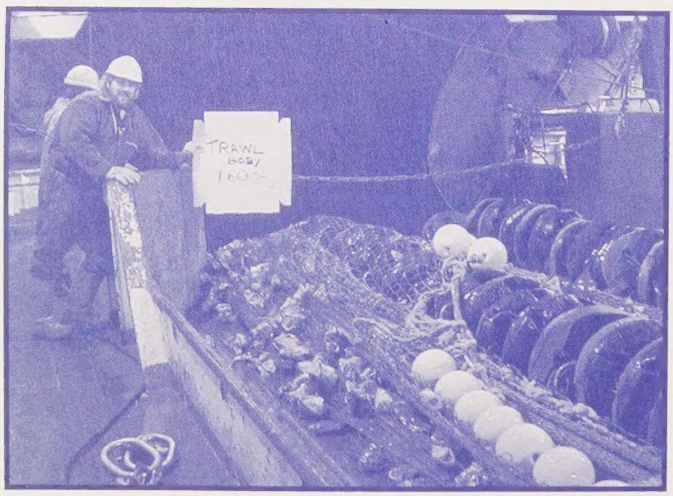
L25=30.0cm
L50=40.2cm
L75=50.4cm
SR=20.4 cm

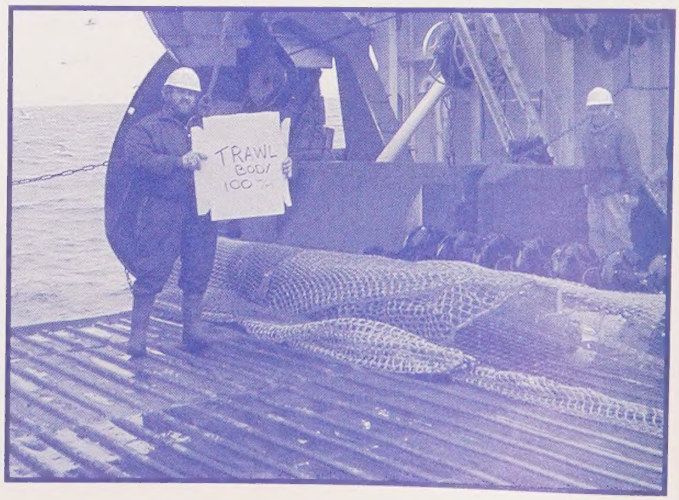
Experiment three compared the catch performance of a standard turbot trawl (constructed of nominal 160 mm diamond mesh and a 145 mm codend) with a trawl having the fore part constructed of nominal 100 mm diamond mesh and a 145 mm diamond mesh codend. It appears that adoption of small mesh in the fore part of the trawl does not adversely affect the amount of small fish retained. However, it does reduce the level of discards and the amount of fish meshed in the fore part.

Results of Turbot Work

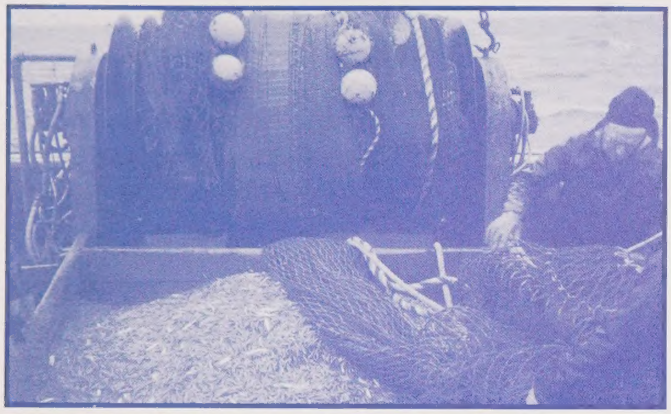
Some important findings have emerged from the work completed by the Turbot Working Group. To begin, trawls rigged with small mesh in the fore part have been shown to practically eliminate meshing without increasing the catch of small fish. With meshing eliminated, there are fewer discards. As a result of these experiments, fishers are now permitted to use small mesh in the fore part of turbot trawls.

Skippers also report that the quality of the catch is greatly improved with small mesh in the fore part and this in turn increases the value of the catch without increasing the quota. Attention is now being directed to research that will make the codend more effective in selecting the catch, for example, the use of 155 mm square mesh codends and other technical measures.

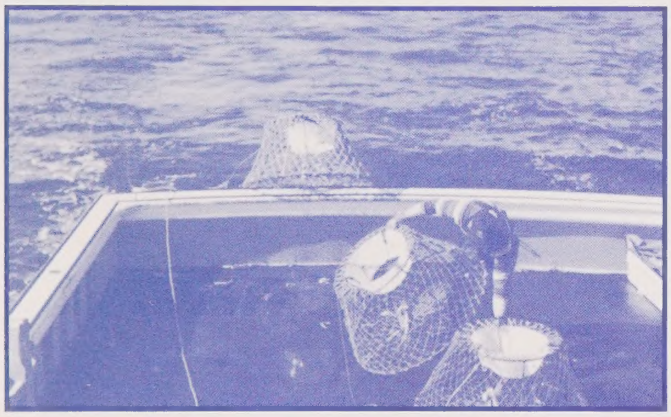




Meshing in the forepart of a turbot trawl is practically eliminated with use of small mesh.



The impact of shrimp trawling on crab grounds is assessed in two-phase study.



The condition of crab is assessed before and after shrimp trawling takes place.

Interaction Between Shrimp Trawling and the Snow Crab Resource

Responding to the concern of crab fishers that high numbers of crab were being caught with broken or missing legs, possibly by shrimp trawling on the same grounds, industry and Fisheries and Oceans Canada (DFO) entered into a joint research study to determine the impact of shrimp trawling on the snow crab resource.

Phase one of the study was undertaken in the fall of 2000 after consultations with the Fish, Food, and Allied Workers Union, crab and shrimp fishers, and representatives from Fisheries and Oceans Canada.

A commercial trawler capable of operating with a shrimp trawl and two, 50-pot fleets of crab pots conducted three, five-day fishing trips in an area cohabited by shrimp and snow crab.

The fishing schedule was as follows:

- trip 1- 5 sea days directing for snow crab;
- trip 2 (50 pots) - 5 days directing for shrimp; and
- trip 3 - 5 sea days directing for snow crab on grounds that had been trawled during trip 2.

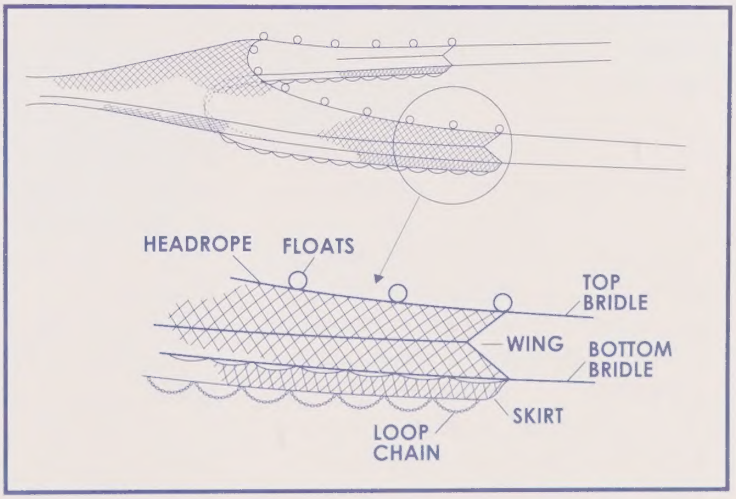
Catches of crab were compared in terms of the number of missing legs, shell condition, and the crab population before and after shrimp trawling had taken place. Results indicate that shrimp trawling has no negative impact on crab resource.

Phase two of the study, comprised of three, 5-day fishing trips, commenced in the summer of 2001 and continued throughout the fall. Fishing is being conducted using a standard shrimp trawl with three retainer bags to collect any crab that go under the footrope of the trawl. These crab are observed and their condition assessed and recorded. Data will be analysed to assess the effect of shrimp trawling on the resource. While the study is not completed, indications are that shrimp trawling has very little, if any, effect on snow crab resources.

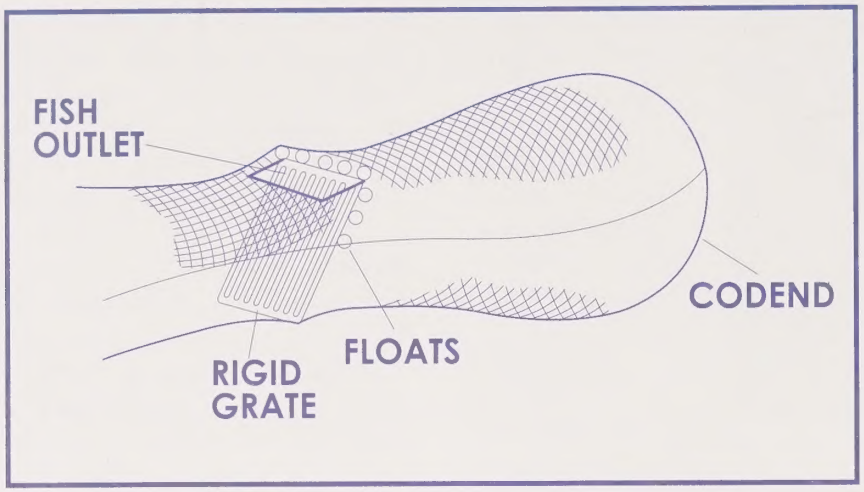
FPI Adapts Norwegian Seining in Cod Operations

Fishery Products International demonstrated its leadership in applying the Canadian Code of Conduct to achieve responsible fishing by adapting Norwegian seining technology for use in their 1999 cod harvesting operations.

Norwegian seining requires no doors, heavy warps or footgear, and a low horsepower. As a result, there is minimum contact with the seabed and a reduction in fuel consumption, making the gear environmentally



Norwegian seine used in FPI cod operations to minimise by-catch of flatfish.



Grids are used to separate flatfish from Yellowtail flounder.

friendly and energy efficient. Use of this technology has practically eliminated the by-catch of flatfish, especially American plaice which is under moratoria. The quality of the catch is also excellent. A schematic of the gear is shown on page 7.

Grids Used to Separate Flatfish from Yellowtail Flounder

The Nordmore grate was introduced to the northern shrimp fishery in the early 90's to minimize finfish by-catches. This technology has been a phenomenal success, reducing finfish by-catches to less than 2%. The addition of a second grid with different bar spacings has helped reduce the by-catch of shrimp less than marketable size. This technology is now being applied to other Canadian fisheries.

FPI in partnership with DFO has developed a grid system to minimize the by-catch of cod while directing for yellowtail flounder. A grid with a vertical bar inserted into the gear allows yellowtail flounder to pass between the bars into the codend, while species such as cod are directed away from the codend and escape through an exit window. The result has been a 90% reduction in cod by-catch with only a small reduction of yellow flounder (8%). A schematic of the grid is shown above.

Gillnets and Ghost Fishing

The use of gillnets is highly controversial. Many who condemn the gear because of the phenomenon known as ghosting fishing, the tendency of lost of abandoned gillnets to continue fishing, say gillnets waste a limited resource and randomly destroy other species. On the other side of the coin, many fishers state that the problem is not the gear, but how the gear is used.

The problem of lost and abandoned gillnets and measures that can be taken to minimize negative effects on the resource and marine environment were highlighted in a video, *The Gillnet Debate*, produced by the Fisheries Diversification Program, Newfoundland Region. The video documents a lost gillnet retrieval project completed by DFO in the Placentia Bay area, as well as, the pros and cons of the gear as expressed by fishers in the area.

Creeping for gillnets was carried out over a six-day period in March 2001 in the fishing area of Bordeaux Head and Bar Haven Island. A gillnet retrieval device, "the creeper," used during the project was designed and constructed by the Marine Institute of Memorial University (with funding from the Canadian Centre for Fisheries Innovation). The device is towed along the seabed, hooking any gillnets with which it comes into contact.

Management measures instituted by DFO are also stressed in the video. These deal with the issues of conservation and responsible fishing and include:

- Limiting the # of nets used by a vessel;
- Requiring:
  - nets to be tagged;
  - lost nets to be reported;
  - inshore nets to be tended within 48 hours
  - offshore nets to be tended within 72 hours.

Gillnet retrieval program completed in Placentia Bay, Newfoundland and documented in the video, The Gillnet Debate.

Projects Related to Energy Conservation

The Department of Fisheries and Oceans in collaboration with industry and support from the Program of Energy Research and Development (PERD) have undertaken several initiatives aimed at improving the energy efficiency of fishing operations. Several projects are described:

Energy Efficiency of Midwater Trawls in the Pacific Hake Fishery

The Deep Sea Trawler's Association of BC conducted a project from May to October 2001, to determine the impacts of new materials in improving the catch and energy efficiency of midwater trawls. Participating in the project were the trawlers, Royal Canadian, Canadian No. 1, and Sea Crest, owned and operated by Radil Bros. Fishing. The project was supported by Fisheries Renewal BC and the BC Technical Assistance Program (TAP).

The use of contemporary rope and netting products in the construction of midwater trawls, which are normally designed to obtain large openings, can result in a significant reduction in diameters of the ropes and twines used in various parts of the trawl. Although the cost of these materials are higher than traditional materials, the reduction in both the weight of the gear and the towing resistance can have very positive benefits in terms of reduced fuel consumption, larger net openings, reduced loads on winches, and gear handling equipment.

The "Sea Crest", owned by Radil Bros. Fishing, takes part in study of energy efficiency of midwater trawls.

The BC project involved computer net design, testing of net cones at the BC Research Ocean Engineering Centre Towing Tank, experimental fishing trials in the Strait of Georgia, and monitoring of the commercial fishing operations of the three vessels involved in the study.

Three identical net cones were made from 4" kc netting using 2.5 mm Euroline Premium, 1.8 mm Euroline Premium Plus, and 1.0 mm Euroneema (Dyneema). Test runs from zero to 4 knots were made with each net cone with the towing resistance recorded by computer. At a speed of three knots and based on the 2.5 mm netting, reductions in towing resistance of the 1.8 mm netting and 1.0 mm netting were 19% and 48% respectively.

"Canadian No. 1" taking part in study to assess the impact of new materials in improving energy efficiency of midwater trawls.

Two, 912 metre circumference, 600 ft headline midwater trawls, (Cantrawl Model 912mx600HL) were constructed and tested at sea aboard the Sea Crest (950 HP) and the Royal Canadian (750HP). The nets were constructed so that three 8", 5-½ "and 4" experimental belly sections of different twine sizes could be inserted into each of the nets for comparative resistance tests. Additionally, the net for the Royal Canadian included Plasma rope in the frame and rope section instead of the traditional polyester rope.

Tests were carried out in the Strait of Georgia aboard the FV Royal Canadian and the FV Sea Crest. Gear geometry, gear resistance, fuel consumption, engine rpm, and exhaust temperature were measured and recorded for each tow. One of the net sections, constructed using 3 mm netting in the 8" and 5½ " parts and 2.5 mm in the 4" part, was used as a standard. The other two

experimental sections used a combination of smaller twine sizes ranging from 2 mm Euroline Premium to 1 mm Euroneema. Based on the standard section, reductions in total gear resistance ranged from 6% to 16.5% and in fuel consumption from 7.5% to 18%.

During the hake fishery, operational data was recorded for both vessels and the Canadian No. 1 (620 HP) that used a similar trawl. That data is being analysed. However, results are encouraging with skippers reporting that in a number of instances during a single tow, they were able to double the catch of adjacent vessels fishing traditional gear. Preliminary results indicate that the new trawls can be operated with much the same engine output required by regular trawls.

Evaluation of Composite Shrimp Trawl

Two commercial fishing trips were conducted off Anticosti Island in the Gulf of St. Lawrence during August and September 2000 aboard the M.V. Dominic Francis. The purpose of the at-sea trials was to evaluate the energy efficiency of shrimp trawls rigged with an alternate netting material.

Compared were the towing resistance, fuel consumption, trawl geometry, and fishing performance of a composite trawl constructed from Spectra, nylon, and polyethylene and a standard trawl of the same type and size. Both gears were Nordsea Labrador Type #1362 having a 1360X60 cm mesh and Bison #13 trawl doors.

Results show that the use of Spectra\nylon twine in that particular trawl configuration resulted in:

- Lower towing resistance
- Larger catch rates
- Larger door and wing spreads
- Reduced fuel consumption
- Average fuel saving of 14.7%\Kg of shrimp

M.V. Dominic Francis participates in at-sea trials off Anticosti Island to evaluate composite shrimp trawl.

Evaluation of New Netting Materials in Silver Hake Fishery

One method of improving fuel efficiency of trawls is to reduce the drag (resistance) of the net. Reducing drag can be achieved by using smaller diameter twines. Accordingly, at-sea trials were conducted during the commercial silver hake fishery to assess the impact on fuel efficiency of a change in netting material.

The drag and fishing performance of a two bridle Nordsea Silver Hake Trawl (fishing circle 504X15 cm mesh), having

M.V. Carmelle III, out of West Pubnico, participating in at-sea trials to assess new netting material.

the standard polyethylene braided material, was compared with the drag and fishing performance of the same trawl rigged with Tricolor Elite High Tenacity Braided Polyethylene material, (thinner and stronger per unit weight).

Results of at-sea trials indicate that:

- Gear tension using the new twine was 8.3 % less than with the standard twine;
- Door spread, wing spread, headline height, and swept were increased;
- The catch\litre of fuel increased (43.9%) with gear rigged with the new twine; and
- Total fuel consumption also increased (42.9%).

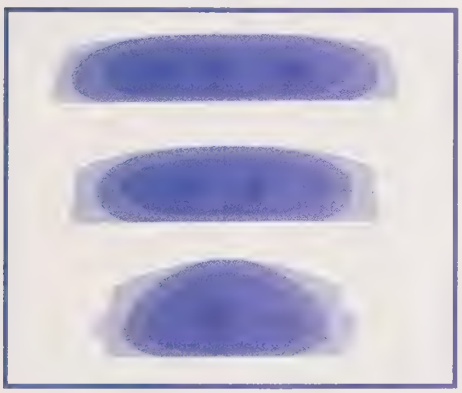
Widebody Triplex Vs Single Trawls in Great Lakes Fishery

Recognizing that fuel efficiency of trawls can be improved with an increase in the horizontal mouth opening of the trawl and by reducing the towing drag, Nordsea developed a

new widebody Triplex trawl for use in commercial fisheries.

Exhibit 1 -
Triplex trawl tested to assess energy efficiency

Exhibit 2 - Frontal view of single codend and the new Triplex and Duplex trawls.



Commercial testing of the Triplex trawl completed in the great lakes in October 2000 compared the performance of:

1) A standard trawl (Nordsea 368 X 15 cm) having one codend constructed of regular braided polyethylene; and

2) A Nordsea Triplex trawl (650 X 15 cm) having three codends each constructed of Tricolor Elite High Tenacity Braided Polyethylene.

Results indicate that the Triplex trawl had:

- 71% greater mouth spread,
- 14% higher catch rate,
- 6.6% increase in catch value per hour of towing ($965 vs $905), and
- an additional catch revenue of $60\hour achieved with only a negligible increase in fuel (0.37 litres\hour).

"Lusty lady", owned by skipper Rob Tryon, takes part in experimental fishing trials to adapted Atlantic technology for use in BC shrimp fishery.

Technology Transfer in the British Columbia Shrimp Fishery

The Pacific Coast Shrimpers Cooperative Association (PCSCA) conducted experiments in March 1999 aimed at transferring the shrimp twin trawl technology used in Atlantic Canada to the BC shrimp fishery.

Shrimp Twin Otter Trawl System

Scottish skipper, John Smith, who provide similar services in Atlantic Canada, and BC shrimp skippers, Guy Whyte, Mark Decort, and Rob Tryon, provided technical input for the project.

The 54 foot F.V. *Lusty Lady* owned by skipper Rob Tyron was selected by PCSCA to complete the experimental fishing trials. The twin trawl system, designed and constructed by Cantrawl Nets Ltd. in consultation with John Smith, was scaled to 70% of the 84 foot Driscoll Trawl, previously fished by the *Lusty Lady*. Each twin trawl was designed having 1200 X 1½" meshes and 64 foot footrope compared with the Driscoll trawl having 1700 X 1½" meshes and a 92 foot footrope. Nets were designed with four panels to facilitate installation and testing of various selectivity devices. Computer estimates were used to compare the Driscoll trawl to the twin system and the Trawlmaster system was used to monitor the gear.

One of the vessel's two net drums was rigged to carry the centre warp and the other drum set up to carry both trawls. The two inner bridles to the skid were adjusted to be the same length as the outer ones to the door.

Before beginning the experiment, fishing was conducted to check the geometry of the gear and to make any needed modifications. At-sea trials were carried out over a three-day period off the coast of Sidney, BC. The third day of fishing was conducted in a different location to evaluate the performance of the gear under different conditions. Skippers Guy Whyte and Rob Tyron were initially concerned that the vessel would have difficulty towing the two nets, but after

the trials they commented favourably on the performance of the gear.

Results indicate that the quantity and composition of the catch in each tow was approximately the same. Overall the twin trawl was more efficient than the traditional single trawl, offering excellent potential for use as a testing system to evaluate selective fishing devices.

Shrimp Twin Beam Trawl System

A second experiment was carried out to test a twin beam-trawl system for application in the BC shrimp fishery. The shrimp beam-trawler, F.V. Esk, was selected by the PCSCA to conduct the at-sea trials. Owner/skipper, Bruce Evans, modified and rigged his beam and provided input into the net design which was based on the Cantrawl High-lift Beam Trawl. The nets were scaled to have a combined horizontal opening of 48 feet, equivalent to the full scale net. Vertical openings were 10-11 feet, 80% of the full scale net, and overall length 75% to maintain similar tapers. The footrope length was reduced to 28 feet to match the headline length.

Fishing trials were carried out over a three-day period. Results indicate that the trawl fished well. Catches were comparable in terms of number and composition. The rpm and exhaust temperature were less resulting in less fuel consumption, an added bonus.

Skipper Bruce Evans takes part in at-sea trials with twin beam trawls.

BC Workshop on Responsible Fishing

The Commercial Groundfish Trawl Industry Workshop on Responsible Fishing held on May 10 and 11, 2001 provided a forum for practising fishers, processors, fishery managers, and other groundfish stakeholders to discuss ways of addressing the issues of responsible fishing.

Participants identified the need for a proactive approach to:

- At sea releases;
- Selective fishing; and
- Catch utilization.

Working groups discussed three strategies to deal with these issues forth. These were:

- Operational changes (fishing gear, electronics, and fishing strategies;
- Changes to fishing rules, regulations, and policies, and
- Market/buyer incentives.

Pacific Salmon Projects

Over the past several years, selective fishing has become a primary, long-term conservation strategy for the BC salmon fishery. Conservation is achieved by developing new methods of fishing, using regular gear in innovative ways, and developing new techniques. Catch and release of non-target species, mandatory revival tanks, barbless hooks for easy release of non-target salmon species, and selective marked hatchery fisheries all contribute to protection of BC salmon stocks.

Fishers in British Columbia have conducted a wide range of First Nation, commercial, and recreational fishery selectivity projects to improve fishing gears and practices. A few illustrations are provided

Commercial Groundfish Trawl Industry Workshop on Responsible Fishing.

Demonstration Seine Fishery

DFO and industry have jointly worked on developing fishing gear and practices to meet the challenge of conservation in area 20 salmon seine fishery. An unexcepted large run of sockeye prompted DFO to devise a selective fishing plan that allowed seines to re-enter the area during the 2001 fishing season.

On August 5 and 6, 2001, seine vessels fished in Area 20 (Juan de Fuca Strait) for the first time since 1997. A total of 73 vessels took part in a demonstration fishery designed to show that selective gear and practices could ensure the release of non-target salmon with a minimum of harm.

Modified revival tank tested against mandatory tank presently in use.

Dip nets are used to release Chinook salmon in the Area 20 Demonstration Fishery.

Measures implemented in the demonstration fishery include:

- Mandatory selective fishing training;
- Observers on vessels to monitor, sample, and verify catches;
- Brailing all sets and use of dip nets to assist with releasing by-catch;
- Sorting boxes for handling one brailer load at a time;
- The use of multiple chutes to allow for efficient release of salmon; and
- An in-fishery mortality study and tagging study measuring survival rates and rate of multiple re-captures respectively.

Information gathered during the fishery will be analysed and used by DFO to make recommendations for development of future fisheries.

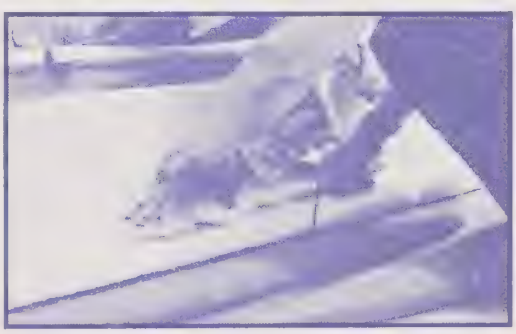
Modifications to Seine Revival Tanks and Salmon Air Exposure Study

The first phase of tests designed to compare the performance of the mandatory seine revival tank with that of a new tank with modifications similar to those used in the gillnet and troll fisheries in BC have begun by John Legate aboard the M.V. Queen's Reach. The technology is simply - salmon needing resuscitation are held in slings suspended in the tank with each fish having its own directed water flow. A few runs have been completed to perfect the technology in the Alberni Inlet area. Further tests are planned with Coho salmon

Two of the four holds on the Queen's Reach have been converted into live tanks so that work can be undertaken to assess mortality rates of salmon based on air exposure. Results show a very low mortality rate (1.5%).

Pacific Salmon Gillnet Fishery

Over the past few years, Pacific salmon harvesters have worked closely with DFO to develop many new tools to make gillnets a more responsible and selective gears. Techniques such as weedlines, revival tanks, short tests, tangle nets, and good handling practices were tested in the 2001 gillnet fishery.



Sockeye being tagged for the Air Exposure Study.

Area 4 (Skeena River short sets, short soak time)

Testing called for short sets involving a soak time of 20 minutes, timed from the time the net was fully extended until the net had to be retrieved. Nets were also cut in half lengthwise to assist with survival of by-catch. These measures allowed non-targeted salmon to be landed alive and released with a higher survival rate.

The special selective fishery opened on July 21, 2001 for six hours with the stipulation that there would be an extension if compliance was favourable. An extension was granted on the first day, extending the fishery until 10 pm. The overall vessel average was 305 sockeye. Fishing continued fora total of 9 days with a total catch of 650 000 sockeye, doubling the commercial gillnet catch in the area for the 2001 season. Fishers demonstrated that conservation can be accomplished with selective fishing tools.

Gillnetters fish off the mouth of Skeena River using new techniques to ensure survival of non-target salmon.

Small mesh Gillnet and Short Set Times

Fred and Linda Hawkshaw's are experimenting with modifications to their gear and vessel that will allow them to live release by-catch while catching economically viable quantities of salmon . Using small mesh nets which catch most of the salmon by the mouth, almost all salmon are landed alive. Revival tanks and four holding compartments have been plumbed for circulating seawater, keeping the catch alive. Combined with a 20 minute soak time, this method produces a high quality product that fetches a high price in the marketplace. while at the same time allowing release of by-catch.

Small mesh gillnets and short soak times produce live salmon and improved quality.

First Nation Fishwheel Study

Nation fishers are adapting the traditional fishwheel gear to meet conservation objectives. The Nisga'a fisheries program, developed in consultation with DFO, and funded by the Aboriginal Fisheries Strategy, is involved in several initiatives.

Two fishwheels located in the Nass River approximately 46 km apart and four fishwheels upstream near Grease Harbour are operate from May to September to:

- Evaluate escapement by capturing and recapturing all species of salmon to determine in-season and post season escapement numbers.
- Collect biological information to determine age and stock composition, running time, and migration rates.
- Harvest sockeye salmon as approved by DFO.

First Nation fishers adapt traditional fishwheel to ensure gear fishes responsibly.

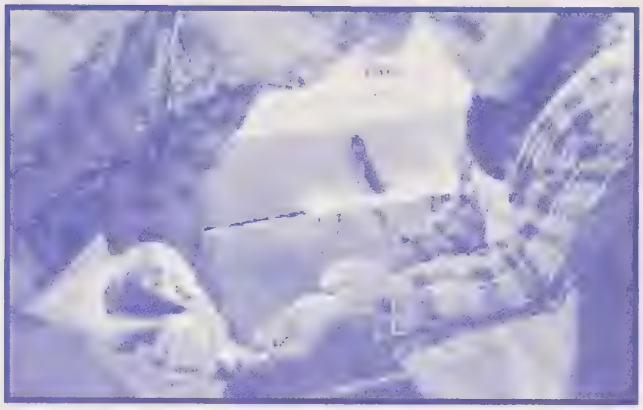
Other programs include:
- Tagging and
- Mortality studies.

It is planned to continue and expand the study beyond 2002 to evolve scientific methods, reduce handling, improve in-season escapement estimates, estimate post-handling survival rates, and develop velocity mapping, turbidity reading, and water level statistical modelling.

Recreational Selective Fishing Project

BC salmon recreational fishers have engaged in a study that compares the use of "pink gear" with conventional coho gear. Over a 14-day period, two boats fished 4 days a week for approximately 6 hours each day, alternating the two gears between boats to prevent any bias. The composition of the daily catch is recorded along with DNA data and information on marked coho.

Wayne Harling - checking his gear.



During the recreational fishing project, coho are sampled for DNA.

TRAINING PROGRAMS IN RESPONSIBLE FISHING

"To create an understanding of the issues facing the industry and, through knowledge of, and practice in responsible fishing, to ensure that participants obtain optimum competency in those subject areas required for the long-term viability of the fishery."

The need for industrial training stemmed naturally from improvements in selective fishing gears and conservation technology that required fishers to have greater knowledge and more skill than had been required; development of codes of conduct that required fishers to implement responsible fishing practices, and the movement towards shared responsibility of fisheries.

Industrial Training Programs

There are two programs presently being offered in the Atlantic region - one at the School of Fisheries at Caraquet and the other at the Marine Institute of Memorial University of Newfoundland. Both courses are 10 days and are modular in format. The main objective of both programs is:

Canada's Industrial Training Program combines classroom work with hands-on practical training that takes place in the flume tank and net loft.

Canadian Industrial Training Program in Responsible Fishing

Module 1
Responsible Fisheries: Historical Perspective and New Initiatives

Module 2
Fishing Gear Design and Harvesting Operations as Related to Responsible Fisheries

Module 3
Fish Biology and Behavior as Related to Responsible Fisheries

Module 4
Fishing Gear Selectivity (Flume Tank)

Module 5
Estimating and Reducing Fishing Mortalities

Module 6
Impact of Fishing on the Resource and the Environment

Module 7
Fisheries Management

Training in Responsible Fishing at the Secondary Level

Responding to concerns that young people were getting a very negative and one-sided view of the industry through the media, a British Columbia fisher proposed the development of a High School Training Module in Responsible Fishing. The Responsible Fishing Module developed is designed to:

"Increase awareness within the BC school system, that procedures and practices can be, and are being implemented at the international, national, and local levels, to ensure that fishing is conducted in a manner which ensures the sustainability of the target species and avoids degradation of the marine environment to the greatest extent possible."

Concurrent with this objective is the desire to educate students about the career opportunities in fields related to the fishing industry. Presently, the module is being offered in eight British Columbia high schools as part of a Social Studies course.

In 2001, the Eastport Peninsula Lobster Protection Committee (Newfoundland) proposed that a module on responsible fishing be developed to "provide a balanced view to young people." Funding has been approved to develop a module in responsible fishing that includes:

- Primary student resources
- A Teacher's Manual; and
- A Secondary Resource Kit

The module which will be pilot tested in 2002 has instructional units that introduce students to:

- Fishing and the economy
- Fishing methodologies
- The science of fish
- Conservation management
- Our fishing heritage
- Careers related to fish and fishing

Canada Participates in International Training Initiatives

Canada is also forging links with international training institutes, reinforcing its position as a world leader in the development and implementation of responsible fishing practices and technologies.

Canada helped develop and each year (1999-2001) participates in the delivery of a series of lectures on Fisheries Management to students enrolled in the Master's Program Safety and Environmental Protection at the World Maritime University, Sweden.

The overall objective of the course is to have students:

"Consider the international and national efforts aimed at establishing a regime for conducting responsible fisheries."

Visiting Professor, Andrew Duthie, DFO, a specialist in the area of responsible fisheries management, introduces students to the Canadian experience with lectures on:

Visiting professors, Andrew Duthie of (DFO) and John Fitzpatrick (formerly FAO), lecture on responsible fishing to a multi-national group of students attending the World Maritime University in Malmo, Sweden.

- The Canadian Code of Conduct For Responsible Fishing Operations;
- Canadian responsible fishing research initiatives; and
- An overview of responsible fishing training in Canada.

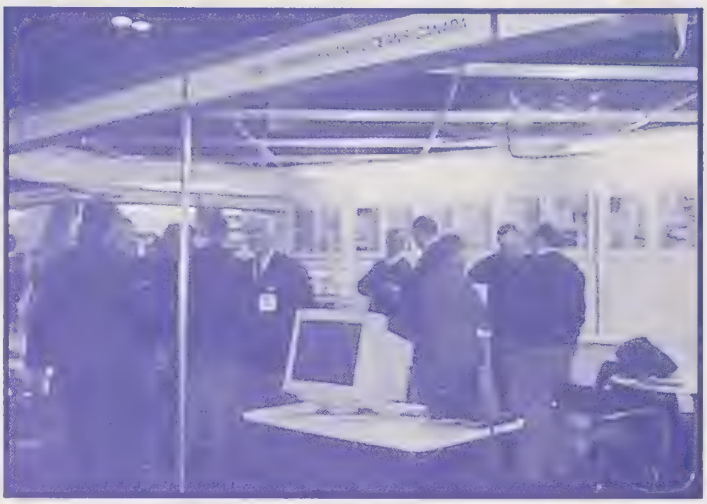
CANADA PROMOTES RESPONSIBLE FISHING INTERNATIONALLY

Canada, committed to the global development of responsible fisheries, has been promoting responsible fishing at major exhibitions and through the exchange of technical information.

FISHING 99 and FISHING 2000
Members of Canada's fishing industry teamed up with personnel from education and research institutions and Fisheries and Oceans Canada to promote responsible fishing at FISHING 99 and FISHING 2000. Highlighted were initiatives undertaken by Canadian fishers aboard commercial vessels to improve conservation technologies, the Canadian Code of Conduct for Responsible Fishing Operations, and Industrial Training Programs.

Fish Expo
Since 1998, Canada has displayed the Canadian Code of Conduct and highlights from responsible fishing projects at Fish Expo in Seattle and other Fish Expo sites (Providence, Rhode Island) in the Eastern United States. The Canadian display provides a national overview of responsible fishing, with the Seattle exhibition highlighting Pacific coast activities, particularly selective fishing work in the salmon industry, and the eastern exhibition emphasising work completed on the Atlantic coast.

The display booth is staffed by government and industry representatives, including practising fishers. It is an opportunity for industry stakeholders to share information with their counterparts worldwide.



Practising skippers and representatives from DFO and other Canadian stakeholders attend FISHING 99 in Glasgow, Scotland.

Fishing Gear Systems 2000 Conference - Glasgow, Scotland
Canada took the stage at a major international Gear Systems 2000 conference, delivering a comprehensive presentation on Canadian responsible fishing initiatives to fishers, vessel owners, researchers, technical personnel, and equipment makers, manufactures, and suppliers.

The message:

> *"The Canadian experience has demonstrated that fishers are interested and supportive of change to ensure sustainability of the resource that they depend on and that the challenge for fishery managers is to harness that interest so that the fishing industry can contribute in a cooperative manner."*

International Technical Exchanges
Since 1999, two North Atlantic Responsible Fishing Conferences have taken place. Organized by the industry for the industry, these conferences provided a forum for the exchange of technical information and the building of networks among practising North Atlantic skippers.

First North Atlantic Conference - Fraserburgh, Scotland
Hailed a milestone in the development of sustainable North Atlantic fisheries, the event was attended by practising fishers and other industry stakeholders (government and education) from Canada, Denmark, Eire, England, the Faeroes, Greenland, Northern Ireland, Scotland, and the United States.

Conference Objectives
The objective of the conference was to provide practising fishers with an opportunity to:

- discuss and exchange practical information on responsible fishing practices and methods;

In plenary sessions, conference participants were provided with an overview of responsible fishing issues and reports from small working groups.

- lay a foundation for future collaborative responsible fishing ventures;
- exchange information on training; and
- formulate a communications strategy targeting industry, government, and the general public.

Several key messages resounded throughout the conference:

a) Responsibility for the successful development of sustainable and responsible fisheries lay in the hands of those who are most knowledgeable about the fishery and could benefit from it the most - practising fishers.

b) The exchange of practical information between practising fishers should result in responsible fisheries in the North Atlantic; and

c) Technical improvements were the cornerstone to improved fisheries, but education and communications were also priorities.

Three plenary sessions were followed by discussion in small working groups chaired by a practising skipper with assistance from a technical support person and a rapporteur. Conference sessions were as follows:

- *Responsible Fishing Practices*
- *Industry training and Communications Strategy*
- *Future Directions for Collaborative Conservation Projects,* and
- *Future Direction for Training Needs and Communication Strategy*

Second North Atlantic Conference - St. John's, Newfoundland

Building on the success achieved in Fraserburgh, Scotland, sixty practicing North Atlantic skippers, technical personnel, and government representatives came together for a second North Atlantic Conference (2001) at the Marine Institute in St. John's, Newfoundland. Organized with support from Fisheries and Oceans Canada and some assistance from government and industry in Europe, the United States, and Canada, the primary purpose of the conference was to develop a cooperative approach to common issues and concerns.

North Atlantic Responsible Fishing Conference (1999) Recommendations

It was recommended that:

1. A fishermen's responsible fishing working group be established to deal with priority issues;
2. A number of collaborative work\projects be established to deal with harvesting technology and industrial training;
3. The sharing of technical information on responsible fisheries be given priority; the use of electronic networking to be the main tool;
4. An industry communications strategy be established to increase the general public's awareness of responsible fishing; and
5. A follow-up North Atlantic Responsible Fishing Conference to be organized. The conference would be held in St. John's, Newfoundland before 2001.

Participants observed flume tank demonstrations of various selective grids for trawls, a triplex trawl, and

Participants attending the second North Atlantic Responsible Fishing Conference in St John's, Newfoundland observe demonstrations of new and innovative responsible fishing gears and energy efficient trawls.

models and full-scale trawls constructed of new twine materials.

Conference Objectives
Objectives established for the conference were:

- to present and evaluate a number of responsible fishing projects;
- to identify new collaborative North Atlantic responsible fishing initiatives and projects to be undertaken by two or more countries and related harvesting technology and industrial training needs; and
- to establish the governing structure for a North Atlantic Responsible Fishing Council and formulate an Interim Group to move this forward.

Conference Sessions
Three plenary sessions provide participants with overview presentations on mutual topics of interest:

Session #1
Selectivity of Fishing Gears
Session # 2
Energy Conservation in Fishing Operations
Session # 3
Progress On Environmental Issues Related to Fishing Operations
Session # 4
Summary Session of Reports and Discussion of Future Work

North Atlantic Responsible Fishing Conference (2000) Recommendations

It was recommended that:

1. An interim committee be established to focus on developing a full mandate and organizational structure for the Council.
2. Members of the Interim Committee to include:
   George Geddes, Scotland
   Jean Guy d'Entremont, Canada
   Tom Best, Canada
   Egil Skarbovik, Norway
   Bill Amaru, United States
   John Watt, Scotland
3. The Interim Committee undertake to draft a statement of the Council aims, consider alternative structures, compile a network directory, and consider funding options.
4. Co-chairs, Geddes and d'Entremont, contact group members to review work to be done, taking into account ideas and projects suggested at the conference.
5. Work begin quickly because of the urgency in dealing with current groundfish issues.

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